TechLine

Information About Invasive/Exotic Plant Management — Winter 2007-2008

Controlling Invasives Benefits Native Species

Milestone® herbicide Control of Canada Thistle in Native Grasslands

By Charles Henry
TechLine Editor

Cover of native grasses increased dramatically when Canada thistle (*Cirsium arvense*) was controlled with Milestone® herbicide in studies conducted by Luke Samuel in western North Dakota. Samuel recently completed his PhD requirements in Natural Resource Management at North Dakota State University in Fargo. He worked under the direction of NDSU professor Dr. Rod Lym.

Samuel also treated areas of native plants that did not contain Canada thistle with Milestone herbicide to determine the herbicide's impact on native plant communities. "The general makeup of the plant species in the native plant community did not change even though the total number of native species found in Milestone-treated plots were less," Samuel states. "In the plots where we controlled the thistle with Milestone, the native grasses and forbs increased."

"The removal of Canada thistle in native plant communities far outweighed any potential injury to native plants resulting from the Milestone treatment," he states. "Benefits to the plant community from removing the Canada thistle outweigh any possible negative impacts on the native plants."

Luke Samuel conducted his research in the Knutson Creek drainage of Theodore Roosevelt National Park near Medora, ND.

Samuel conducted his research in the Knutson Creek drainage of Theodore Roosevelt National Park near Medora, ND. The experiment was located within the wilderness area so wilderness guidelines were followed with no mechanized equipment used.

Samuel established 30 plots, 20 ft by 30 ft wide, in the drainage that contained a range of Canada thistle densities. He also established the same

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"Everything in nature is lyrical in its ideal essence, tragic in its fate, and comic in its existence."

...George Santayana

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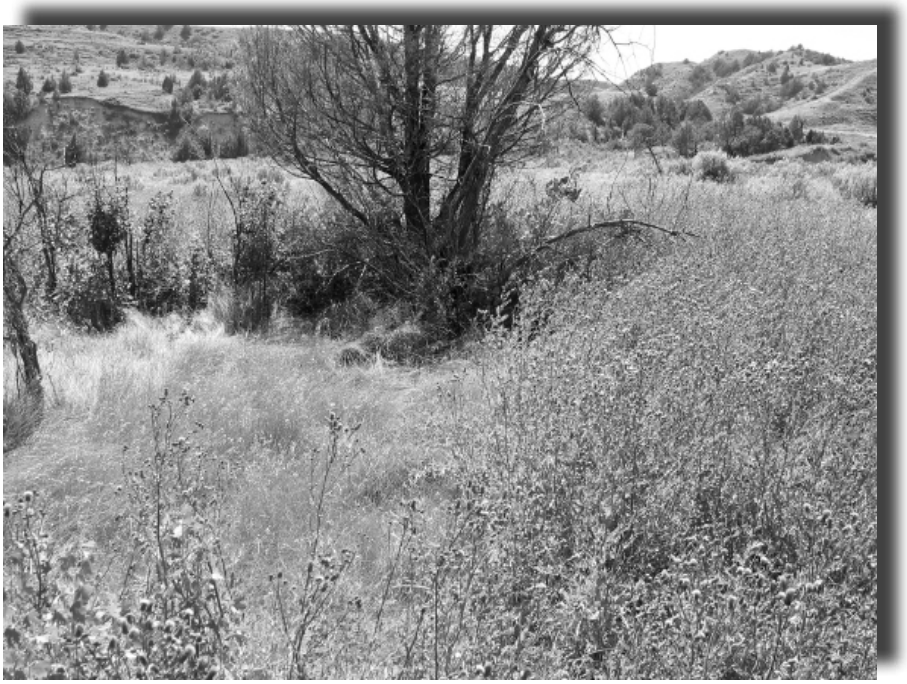

number of plots that did not contain any Canada thistle. Each plot was divided in half, with half being treated and half serving as a control so there were 30 replications.

He applied Milestone herbicide at the maximum recommended label rate of 7.0 fl oz per acre to the plots containing Canada thistle and to the plots that contained only native plant species in September 2004. Samuel tried to mimic normal National Park Service procedures for treating noxious weeds. The plots were evaluated 10 months after treatment (MAT) and 22 months after treatment.

"Our first observation was that Milestone provided excellent control of the Canada thistle. We evaluated the density of Canada thistle in those plots that were infested before we applied the herbicide **(Chart 1)**. After treatment, we measured how much thistle was left again counting the number of stems in 0.25 meter squared frames," he says. "Additionally, we identified and evaluated the amount of all native plant species by evaluating foliar cover at peak standing vegetative biomass in July both prior to herbicide application and 10 and 22 MAT."

Samuel says they counted about 100 different species of grasses and forbs during the study. However, they found more species in the Canada thistle-infested blocks as these areas typically had more bare ground and annual and biennial species tended to move into and out of these areas more frequently. Canada thistle densities within plots ranged from very dense to complete monocultures.

"In general, the Canada thistle plots were a more disturbed type of site and contained more bare ground. And as the density of Canada thistle increased, we found fewer native species present. Canada thistle is definitely competitive and displaces native vegetation."

Samuel reports that native plots without Canada thistle present that were treated with Milestone herbicide tended initially to reduce the annuals, biennials, and other low seral native species and some perennial native forbs. In general, the Milestone did not impact the dominant native grass species in general with the exception of some minor injury to slender wheatgrass (*Elymus trachycaulus*) in the native plots.

"We can definitely say that we affected several native species in both the native only plots or the plots with Canada thistle. Initially, the native legumes such as milkvetch (*Astragalus Canadensis*) were removed, which we would expect with Milestone. And we also

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Chart 1

Canada thistle stem density in the Canada thistle-infested plant community prior to treatment with Milestone® herbicide and 10 and 22 months after treatment (MAT) at Theodore Roosevelt National Park, Medora, ND

Treatments (a)	Rate	0 MAT	10 MAT	22 MAT
Milestone	7.0 fl oz/A	31	2	16
Control	-0-	32	31	42
LSD (p=0.05)		---------- 4 ----------		

(a) Surfactant Activator 90 at 0.25% was applied with treatments.

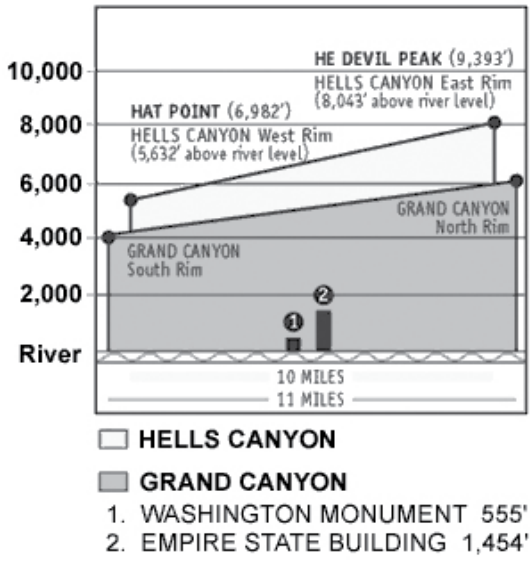
Twelve-year Cooperative Effort Pays Dividends

By Charles Henry
TechLine Editor

The Tri-State Weed Management Area (WMA) comprising 250,000 acres in Idaho, Oregon, and Washington on both sides of the lower Snake River was one of the original federal Demonstration Weed Management Areas created in 1995. Lynn Danly, natural resource specialist for the Bureau of Land Management (BLM) headquartered at the Cottonwood Field Office in Idaho was the WMA's first chairperson and remains in that role (***see "Tri-State WMA Cooperators" on page 4***).

"One measure of our success is that we were originally funded for four years and we have demonstrated enough progress to maintain our funding for 12 years," Danly says with a small laugh. "Actually, the re[T]-sure of our progress, we are not calling it 'success' yet, is that we have developed several management practices that are working very well and are being copied by other WMAs now."

The WMA covers the lower portion of Hells Canyon, North America's deepest river gorge (***see chart below for comparisons***). It encompasses a vast and remote region with dramatic changes in elevation, terrain, climate and vegetation. Carved by the great Snake River, Hells Canyon plunges more than a mile below Oregon's west rim, and 8,000 feet below snowcapped



Lynn Danly, natural resource specialist for the Bureau of Land Management (BLM), Cottonwood, ID.

He Devil Peak of Idaho's Seven Devils Mountains. By comparison, the Grand Canyon rises 6,100 feet above the Colorado River at its deepest point. There are no roads across Hells Canyon's 10-mile wide expanse, and only three roads that lead to the Snake River between Hells Canyon Dam and the Oregon-Washington boundary.

Danly says cooperators knew that the steep terrain and very remote nature of the WMA was going to be difficult. "It is nearly impossible to reach some areas, let alone implement weed management on those areas," she says. "We have had our share of setbacks, but we have also answered some of the challenges."

Prioritization

Prioritization was the group's first task. Yellow starthistle (*Centaurea solstitialis*) was well established in the northern end of the canyon and their first priority was to keep it out of the southern end. Next they wanted to keep leafy spurge (*Euphorbia esula L.*) and spotted knapweed (*Centaurea stoebe*) from coming down the Salmon River into the Snake River canyon. And they were determined to prevent, as much as possible, rush skeletonweed (*Chondrilla juncea*) moving in from surrounding states.

Mapping and Inventory

Danly explains that their next task was to inventory their weed problem so they could measure their progress. "This was slow and difficult at first, again due to

See "Tri-State WMA" on page 4

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the nature of the terrain. We explored using satellite imagery, but this was expensive and due to the elevation changes you can't obtain a one-time image focusing on blooming yellow starthistle and find it all. Plus we discovered the light signature reflected from yellow starthistle mimicked bunchgrass during certain times of the year."

Danly says they turned to a partnership with The Nature Conservancy's Hells Canyon Initiative for inventory help. The TNC was having good success with aerial sketch mapping from helicopters. An observer knowledgeable in plant identification flies with an ArcPad™ tablet on his or her knee and sketches infestations. The ArcPad is tied into the helicopter's GPS system to provide real time locations of the weeds the observer is drawing into the software via the tablet.

"Accuracy is nearly 85% and the cost is approximately $.25/acre. Timing is critical, however, with some species such as Dalmatian toadflax (*Linaria dalmatica*). You can see it easily one week, but just a few days later the moth mullein blooms and it becomes very difficult to tell them apart."

The cooperators have now completed inventorying

Tri-State WMA Cooperators

Asotin County, WA Weed Control
Baker Bureau of Land Management
Bureau of Land Management – inclusive
Cottonwood Bureau of Land Management
Chief Joseph Wildlife Management Area
U.S. Forest Service – Hells Canyon National Recreation Area, Wallowa-Whitman National Forest
Idaho Department of Fish and Game
Idaho Department of Lands
The Nature Conservancy of Idaho
Lewis County, ID Weed Control
Nez Perce Biocontrol Center
Nez Perce County, ID Weed Control
Nez Perce Tribe
The Nature Conservancy of Oregon
The Nature Conservancy of Idaho
Private Landowners
Student Conservation Association
Tri-County Weed Management Area (Oregon)
The Nature Conservancy - inclusive
University of Idaho
Wallowa County, OR Weed Control
WR Wallowa Resources

the entire canyon and they are confident they know where new infestations of whitetop or hoary cress (*Cardaria draba L.*), Dalmatian toadflax, and yellow starthistle are located in the canyon.

Prevention, Education and Awareness

Their next step was to implement prevention, and education and awareness programs to minimize current infestations' spread and stop new infestations as much as possible. They developed an awareness program with jet boat and rafting outfitters as well as hunting outfitters who are permitted in the WMA. They also implemented a weed free forage program. And they have a weed washing program at fire camps to prevent fire crews from bringing weeds in or taking them out on equipment.

They also realized their herbicide applicator crews needed very intensive training. It is simply too expensive to take a crew and equipment into the rugged terrain and not have them do a proper application job as well as operate safely. Human safety is a priority as crews work a great distances from medical assistance and in very difficult geographic and climatic conditions (the country is steep and temperatures are high during the application season.)

Management Techniques

Danly says they use herbicides, biological insect releases, hand pulling and a rapidly growing revegetation program as their primary weed control tools. They have also instituted an extensive biological insect control program, distributing insects by hand and from the air in the more remote areas.

Numerous herbicide tools are utilized including Transline® herbicide and Tordon® 22K herbicide. Most applications are along travel corridors and in other

Researcher Sees Possibilities in New Tools and Techniques

By Charles Henry
TechLine Editor

Knotweeds are spreading into more areas in the Western U.S. as researchers scramble to find control solutions for this escaped ornamental. Knotweed species are out-competing existing vegetation and ruining habitats as they clog streambanks and dominate stream channels in more areas (***see "Knotweeds" on page 7***).

"I am somewhat humbled by this invasive plant species. Each time we seem to have a method of control, it may work at one growth stage, but not another or on one species of knotweed and not so well on one or more of the others. Often, as a researcher, I can obtain control, but when our research methods are transferred to large-scale application in the field, the results are not as good as in our test plots," say Kim Patten. Patten is a Washington State University extension professor in Long Beach, WA.

See "Knotweeds" on page 6

Kim Patten, Washington State University, Long Beach, WA, holds a knotweed plant that illustrates how large this species can grow.

areas they can access with their ATV, truck-mounted, or backpack sprayers. One of the partners in the WMA, the Idaho Fish & Game Department, has begun using Milestone® herbicide for yellow starthistle control on their lands in the WMA and they are happy with the control being obtained, according to Danly.

Danly says their revegetation program may be one thing that is unique about their management efforts. "Just treating yellow starthistle with a herbicide is often not enough in this ecosystem. Downy brome or cheatgrass (*Bromus tectorum L.*) is so prevalent that it will immediately occupy areas where you remove the starthistle. Our program's goal is to reduce invasive annual plants, but also keep them out so we can deplete the weeds' seed bank."

"We do this by first reseeding with perennial introduced species such as intermediate wheatgrass and pubescent wheatgrass or hard and sheep fescues. We plan to follow-up by inter-seeding native grasses and forbs once the sites are converted from an annual ecosystem to a perennial ecosystem more reminiscent of the native one that existed originally. We have not been able to successfully establish native grass species directly into these intensely competitive sites. With this two-step approach we have reestablished a stable perennial plant community that keeps the weeds out with only occasional spot spraying, we have a forage resource, and we have time to inter-seed with natives when they have a much better chance of survival."

Generate Data to Measure Success

Danly says she was frustrated at first in finding data that would tell them when they had reached a plant density after weed management that would maintain a stable eco-system. Fire rehab work had generated similar data, but their goals were different than those of the WMA.

"We began doing our own monitoring to generate this data. We established 50-ft. belt transects where we had removed the weeds and reseeded. We counted every desirable plant in these transects a year after seeding," she concludes. "We found that when we had 0.82 plants per square foot of any desirable species, then we were successful and the eco-system would remain stable and keep weeds out. Five years after we began controlling the weeds, reseeding and keeping the weeds down with periodic spot treatments, they are holding."

"Knotweeds"
Continued from page 5

"I think that generally we have spent too much money initially on applications in the field and not enough on researching the best control methods. I understand people's frustrations when they think that we are 'studying a problem to death' when we already have some methods of control approved for use," Patten states. "However, with knotweed, we are finding that there is more that we do not know than what we do know. We may be out there trying to control knotweed before we know how to achieve long-term efficacy ***(see "Knotweed Control Summary" below).***

Knotweed Control Summary

Kim Patten, WSU extension professor in Long Beach, WA, summarized the various control options for the knotweed species as follows:

Mechanical: This method is not a long-term solution and is difficult to implement in the riparian zones where most knotweed grows.

Pulling: Pulling can be effective only if the knotweed is newly established. It is also very labor intensive and difficult as the rootcrown of some knotweed clumps can weigh several hundred pounds.

Biological: The U.S. Forest Service is funding research seeking insects from Japan and similar habitats. They are researching stem borers and seed weevils, which are good candidates, but they are far from having an effective release organism yet. Patten says knotweed is an ideal candidate for biological control because it has spread over such a wide area that eradication with herbicides is not feasible. However, effective herbicides will be very important in any management plan.

Herbicides: There are several herbicides that are currently labeled for knotweed control. Patten says broadcast application of imazapyr (Habitat1 herbicide) shows better efficacy than glyphosate in most cases, but is not the answer in all situations as it can damage grasses. A method was developed several years ago to inject 2-5 ml of glyphosate into the third through fifth nodes of knotweed plants. This method had the advantage of being very targeted, however it is expensive and very labor intensive on all but small stands of knotweed. Patten notes that at 5 ml/stem, only so many stems per acre can be treated to stay under label recommendations.

Patten says that some of his recent research is beginning to show that resource managers need to take several key factors into consideration before adopting only one control method. He began work in 2006 with Milestone® herbicide and noticed that he achieved good control at the higher labeled rates of Milestone on some stands of knotweed, but not others. The older, more established the stand, the larger the root crown, the harder it is to control. He noted the same trend with Habitat herbicide and glyphosate herbicides.

"There is also a problem achieving final control of a clone if it has been severely damaged by herbicide in the past. Translocated herbicides will not control these damaged plants as well as undamaged plants," Patten says. "So what do you do – spray it again or let it regrow for a year? There is also the challenge of covering the entire canopy when using a herbicide. These are large stands, 12 to 15 feet tall in inaccessible locations."

Knotweed can grow from six inches to one foot in one week. Stems break off in the fall or winter and will root at any node, which will establish a new plant, according to Patten. These challenges led Patten to ask, "What if we hit knotweed when it was just starting to grow in the spring?" He began trials to treat plants when they are still short (2 to 5 ft. tall) with glyphosate, Milestone, Renovate herbicide, and Habitat herbicide.

"With Milestone, spraying during this early growth period (April through May) appeared to provide a good window for control," says Patten. "On an upland stand of knotweed where we did the early application, we had minimal regrowth. There is always a concern for off-target species damage with foliar sprays and this is where Milestone herbicide can play a role."

Patten has also tested basal treatments with Milestone when the plants first flush and he is obtaining good control at the higher labeled rates. "There are opportunities here, but we are one to two years away from having the best program defined," he says. "We also want to see if tank mixing glyphosate with Milestone will enhance the treatment and allow us to lower the rate of Milestone."

Patten says he is beginning to see management pat-

terns that are important to land managers and applicators based on their trials. First, it is important which species of knotweed one is trying to control. There are differences in control with several of the currently used herbicides, based on species. Second, recommendations should change (rates and application timing) based on the age/vigor of the stand and growth stage. Third, what is the most cost effective treatment and when and how much will be required?

By answering these questions first, and matching their control program to what works best for each scenario, land managers can increase their chance of success towards controlling this very challenging unwanted plant species, he concludes.

Knotweeds

By: Tom Heutte, Michael Shephard, and Cyndi Snyder, USDA Forest Service, Alaska Region, State and Private Forestry, and Jamie Snyder, UAF Cooperative Extension

Knotweeds *(Polygonum spp.)* are recognized as a significant invasive plant problem throughout much of the northern United States, British Columbia in Canada, and the United Kingdom. Three species of particular concern are: Japanese knotweed (*Polygonum cuspidatum*), giant knotweed (*P. sachalinense*), and a hybrid cross of Japanese and giant knotweed known as Bohemian knotweed (*P. x bohemica*). The three are often collectively referred to as "Japanese knotweed."

Knotweeds were originally imported from Asia to North America as ornamentals and for use in stabilizing disturbed sites. Due to its invasive characteristics, many states prohibit its use in landscaping.

Description

Invasive knotweeds are herbaceous perennials with stems up to ten feet tall. Leaves are broadly oval to somewhat triangular, with a satiny texture. The hollow stems with their thickened nodes resemble bamboo, but lack the long grass-like leaves characteristic of bamboo. Stems are also angled slightly at each node. In late summer plants produce branched sprays of tiny white flowers.

In late fall the stems die back, but the underground stems, called rhizomes, survive the winter in a dormant state. In early spring, the rhizomes produce new rapidly growing shoots, which can quickly dominate the site. The roots and rhizomes of a knotweed plant form an extensive underground network, growing up to 45 feet in length.

To differentiate the three species use the following: Look at leaves from the middle of a stem, not the shoot tip leaves, which are highly variable. Hairs on the midvein on the underside of the leaf are diagnostic of the species. Use a 10X lens to view the backlit leaf bent over a finger.

P. cuspidatum: Leaves are flat-based, with an acutely tapering (cuspidate) tip. Hairs are reduced to bumps.

P. sachalinense: Leaves have a deeply notched base with a short, untapered tip. Hairs are multicellular, kinky, and long.

P. bohemica: Leaves are intermediate between the other two species. Hairs are shorter, unicellular, with a broad base.

Life History

Knotweed is primarily spread by root expansion and vegetative regeneration of rhizomes and stems. Very small fragments of root and stem can produce new plants. Therefore, the spread of this plant is exacerbated by flood events and the movement of soil from knotweed infested areas. Pieces of root or stem moved with soil from excavation, landscaping, or roadside ditching might quickly establish new colonies where the soil is deposited. Fragments have also been spread by disposal of contaminated yard clippings. Reproduction by seed is less typical, but has been documented on many occasions.

Impacts

Knotweed is a concern for several reasons. Most notably it can grow along streambanks and even within streams where it restricts or blocks streamflow and degrades salmon spawning grounds. Once established in or near a stream, knotweed can move by floodwaters to colonize an entire watershed. It chokes drainage ditches and can break up pavement with its expanding network of roots. Shoots have been observed growing up through two inches of asphalt.

Knotweed spreads quickly, forming dense stands that prevent regeneration of native vegetation and suppresses the growth of existing vegetation. Wildlife that depends on native vegetation for food and shelter are displaced. Furthermore, organisms within the stream are deprived of the insects and native plant material that fuel the aquatic "food chain," ultimately reducing habitat quality for juvenile salmonids.

By Charles Henry
TechLine Editor

Dual Approach of Testing and Landscape-size Applications Yields Answers

Beginning in 1998, The Nature Conservancy (TNC) stewards noticed Japanese, Bohemian, and giant knotweeds invading the Sandy River Watershed in northern Oregon, according to Doug Kreuzer, TNC Land Steward for the Portland Area Preserves. Many different control methods were tried including manual cutting, herbicide injections, and low volume foliar spraying over the canopy to stop the spread of knotweeds through this critical river system (***see "Impacts of Knotweed on Sandy River Watershed" on page 9)***.

In 2000, TNC decided that they needed to do more. As part of a TNC landscape level riparian habitat restoration project in the Sandy River watershed, they developed experiments that would establish small test plots to measure the effectiveness of different herbicides, rates, and timings. At the same time, they took a subset of these methods out onto the landscape and began applying them under "real world" conditions to address the threats in the watershed. The small scale research combined with the landscape-level work helped show them which methods needed fine tuning and which ones were ineffective.

Replicated plots were established that measured 17 different treatment combinations for controlling knotweed. Treatments included manual control, two herbicides (glyphosate or Rodeo® herbicide and triclopyr or Garlon® 3A herbicide), two application methods (foliar spray and wick), three application timings (spring and fall, summer only, fall only), and combinations of manual treatment with herbicides. The measure of control was the number of stems produced at a given site at the time of monitoring.

Foliar treatments of Rodeo and Garlon 3A were also made along with cut stem and stem wicking applications in the spring and the fall. Garlon 3A was applied in the foliar treatments at a rate of five percent solution plus a surfactant. The foliar Rodeo was applied at a rate of five percent solution plus a surfactant. All treatments were repeated annually for three years.

"We learned that manual cutting was not effective on a landscape scale nor was it practical," Kreuzer says. They found that all of the foliar herbicide treatments

Doug Kreuzer, TNC Land Steward for the Portland (OR) Area Preserves.

on average provided a good level of control (80% control measured one year after treatment (YAT), but no given treatment group provided 100% control of all patches after one year. Timing of herbicide treatment was found to be somewhat important. The spring-fall foliar herbicide treatment group did not deliver control benefits beyond the spring manual cut / fall foliar herbicide combination.

Kreuzer also mentioned, "Stem wicking treatments were less effective and more time consuming than foliar applications, and do not appear to completely control knotweed, even after three field seasons." For the reasonably small patches (<200 stems) that were tested, they found that knotweed was effectively controlled within two field seasons of foliar spray treatment with triclopyr. Foliar treatment by glyphosate alone was less effective at fully eradicating most patches, requiring three or more annual treatments in every case.

In 2003, TNC in partnership with Metro Parks and Greenspaces began another set of experiments to test effectiveness of the stem injection method of herbicide application on knotweed in both a controlled small-scale setting and again on the landscape.

Two main issues were addressed in this controlled experiment: application dosage and timing. Sixty patches of knotweed that contained from 30 to 200 stems per patch were selected for either a July or September in-

jection group. Patches were randomly assigned to one of four treatment groups (1.5 ml, 3 ml, 5 ml, or 5 ml stem injection rate plus supplemental foliar spray) or a control group. In all, they found that stem injection with or without the supplemental foliar spray treatments reduced the stem number, diameter, height and spread of knotweed patches. Treatment date had no significant effect on stem reduction.

Two years after the treatment, stem injection with glyphosate effectively reduced stem number in all treatment groups with an average reduction of over 90% with no significant difference between the treatment groups. Larger patches tested on the landscape injected with 3ml or 5ml plus supplemental foliar spray of the smaller stems were found to reduce the stem number by 70% on average (YAT). Although they found the stem injection treatment did show promising results early on, they found it is quite labor intensive, uses higher quantities of herbicide per patch, and larger patches were still persisting after several field seasons of treatments similar to the previously tested foliar herbicide treatments.

The results of these experiment trials over the past seven years have prompted TNC and its partners to adjust their management on the landscape on a yearly basis and continue to investigate new products and application methods. "We are still doing stem injections on isolated patches where there is a significant amount of native vegetation present and where accidental drift might present a problem," Kreuzer says. "We don't have 100 percent control without retreating stands for two to three years and we still have some sites producing knotweed stems five years later."

They are also testing Habitat herbicide as foliar applications at different rates and in combination with glyphosate or Rodeo® herbicide.

"So far we are finding that it is relatively easy to control fully developed, but smaller stem count infestations with June to September timings with low volume foliar applications of the herbicides we have utilized, but we still have a problem achieving the same control results when working on massive canopied, many stem infestations," he explains. "Application of Habitat during rapid growth periods in the early spring appears to result in reasonable control, but will require some follow-up treatments and continued study. Finally, none of the herbicides evaluated showed any long term residual effects that would prevent succession by native species, though replanting may be necessary at larger sites," he concludes.

"Knotweed is a vexing problem and a threat to our riparian ecosystems, but one that we feel we ultimately can contain and manage if addressed early on. The value of the resources threatened makes continuing the effort worth it."

Impacts of Knotweed on Sandy River Watershed

The Nature Conservancy (TNC) is involved with other partners in the protection of the Sandy River Watershed in northern Oregon because of the many unique biological values encompassed in the 500 square mile watershed, according to Doug Kreuzer, TNC Land Steward for the Portland Area Preserve.

"We own and manage six parcels, about 400 acres, in the lower Sandy River Gorge, but these are critical acres to the entire watershed. One area borders old growth Douglas fir and hemlock and another contains a very unique meadow habitat," he explains. On a much larger scope, TNC has been spearheading and managing a riparian habitat protection program directed at controlling knotweed in all riparian corridors spanning 120 river miles in the Sandy River basin.

"Three knotweed species, mainly the bohemian variety, are threatening the biological functionality of this watershed," Kreuzer says.

"First, the knotweed is quickly displacing native vegetation. The Sandy River Watershed supports regionally significant populations of rare and characteristic wildlife. Among these are 22 species of state or federal concern, including Chinook and Coho salmon and winter steelhead listed as threatened under the federal Endangered Species Act. The potential long-term impact is that the ecosystem will cease to function because there is less recruitment of riparian trees due to knotweed's ability to form dense monocultures along many miles of the river," he says.

"Second, knotweed is taking resources and preventing new growth of cottonwoods and other species that ultimately provide woody debris in the river which is critical to spawning salmon. These trees provide shade and cool the river which is important for fingerling salmonid species before they return to the ocean. "Knotweed also increases stream bank erosion because it does not possess the fine root hairs of tree and brush species," Kreuzer explains.

For more information on The Nature Conservancy's knotweed research and work in the Sandy River watershed, visit http://tncweeds.ucdavis.edu/esadocs/polycusp.html

Innovative Herbicide, New GPS Tools

Lincoln County Grapples with Second Home Growth

By Charles Henry
TechLine Editor

The challenges facing Kevin Hupp, Lincoln County Noxious Weed Control supervisor in Davenport, WA, are the same ones that other Western counties increasingly face. "What are all these people doing here and why don't they know anything about weeds" is a common refrain of many land managers in the West. Hupp says Lincoln County is primarily a farming and ranching community of 10,300 people 40 miles east of Spokane. Now, city folks from Spokane and even Seattle and Tacoma are building second and retirement homes in the northern part of the county. Drawing these newcomers to the area is Lake Roosevelt National Recreation Area, a large impoundment behind Grand Coulee Dam on the Columbia River.

"The recreation area receives 2.4 million people each year, and many of them have decided they want a second or retirement home here," Hupp says. "We have always had farmers and ranchers who created and supported our county weed program. Those in agriculture understand the impact noxious weeds have on rangelands and cropping systems. But the new folks are not as aware."

Hupp says their main weed challenges are Dalmatian toadflax (*Linaria dalmatica*), Canada thistle (*Cirsium arvense*), leafy spurge (*Euphorbia esula L.*), and the knapweeds (*Centaurea spp.*) such as spotted, diffuse and Russian. "This weed spectrum in combination with all the new landowners in the county presented us with some unique headaches for awhile."

Two powerful tools used by Hupp and his crews are making these headaches go away. First, they began using and recommending Milestone® herbicide to their landowners. "With the new folks any product that carried a 'Restricted Use' label was never going to be used. These people come up to relax and recreate and they barely have time to manage weeds, let alone take tests and get certified to use restricted label products. Second, the 'Caution' signal word on the Milestone label and the ability to use it right up to 'water's edge' are a huge plus with this group. And we are achieving excellent control of the thistles and knapweeds with this herbicide," Hupp explains.

"Our Dalmatian toadflax control has been good with a combination of Milestone applied at a rate 5.0 fl oz/acre tank mixed with Telar herbicide at a rate of 1.5 oz/acre applied with a non-ionic surfactant early in the year. After flowering, we switch to straight Telar," Hupp says.

To build awareness and cooperation among their new landowners, Hupp and his staff upgraded their website and simplified some of the weed descriptions and options for control recommendations. They also created their own set of pamphlets and fact sheets that are left behind with the landowner whenever they call.

"If a landowner will read the brochures, and most of them do, after that first call, then at the next conversation they are much more informed and willing to talk about control options. Whenever we visit a recreational or second home landowner we try to walk their property with them and not leave until we have a weed management plan at least begun for them," Hupp explains.

The second tool that has paid dividends for Hupp is a switch to new GPS mapping equipment. The sheer volume of new, small parcel landowners meant they had to find a way to map and inventory weeds on many more parcels than previously. Two years ago, the county invested in Thales Magellan MobileMapper CE GPS units. These handheld units are bundled with ArcMap software and can map input from a handheld radius (pen stylus).

"With these units we don't have to walk every square foot of land. Parcel lines are preloaded on the units and

if a crew member can see an infestation on a hill or across a draw with the help of good binoculars, they can estimate the size of the infestation, identify the weed species, and then enter the information with the stylus," he says. The parcel maps on the units are tied into the county's assessment maps so they know who owns each piece of property.

Each week they download this data to generate weed maps that can then be used when they visit landowners to show them the extent of their weed problem. "The units are not inexpensive, about $2,400 each, but we have been able to reduce our crew from eight to four people. The real value is that since we only need to hire four people, we can pay more per hour and get good local help who know the county and know weeds," Hupp states.

Hupp also manages an extensive biological insect release program in Lincoln County. They have released more than 60,000 insects for Dalmatian toadflax control for landowners and also insects for spotted and Russian knapweed management. What has worked best is distributing insects on the interior of a piece of property and then spray the external boundaries with herbicides, he concludes.

Magnets Key Simple Nozzle Mount

Lincoln County crews use ATV sprayers and slide-in pickup sprayers in their noxious weed control work. Most of this work is done from these units with up to 300-ft of hose and hand nozzles. However, at times the terrain dictates that they could use a broadcast spray pattern. Hupp did not want to invest in boomless nozzles just for the few times they would use a broadcast application. So he presented the problem to his supplier, Spray Center Electronics in Airways Heights, WA, and they developed a simple, but effective solution.

On the ATVs they mounted 12-inches of 1-inch diameter PVC pipe with three diaphragm TeeJet nozzles in the pipe that create a 10-ft spray pattern. Two TeeJet #00-06 nozzles are mounted on the end and one TeeJet #10015 is in the middle. This pipe was then mounted via a bracket to a 2-inch magnet **(Photo 1)** and plumbed into the sprayers at a t-valve that splits flow to either the handgun or to the pipe-mounted nozzles. On ATVs they mount right to the racks as needed **(Photo 2)**.

"The pickup sprayers are similar and mounted via the magnet to the bumper **(Photo 3)** or to the receiver hitch **(Photo 4**) depending on the height of the pickup," Hupp explains. "I sometimes take the ball hitch off the receiver and place the boom on it. I can invert the hitch receiver to adjust height."

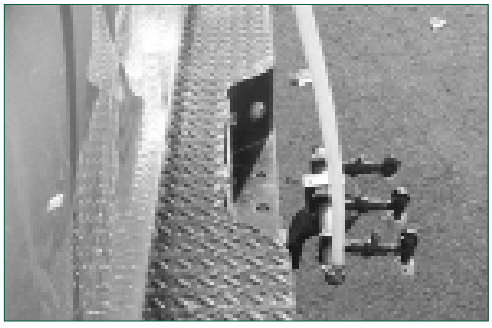
Each pickup unit comes with two TeeJet #00-12 nozzles on the ends and a TeeJet #8002 nozzle in the middle that combine to provide a 20-ft width pattern. Both ATV and pickup units are equipped with 12-ft of hose (or whatever length of hose is specified) and costs just under $100. They don't come off in the field and are very easy to mount and remove, according to Hupp.

Photo 1

Photo 2

Photo 3

Photo 4



"Native Grasslands"
Continued from page 2

saw some minor injury to slender wheatgrass in the native plots. But when we evaluated the plots the second growing season after treatment, each species that we had eliminated had returned," Samuel says.

"The slender wheatgrass injury in the native plots was interesting in that in the Canada thistle plots where we controlled the Canada thistle with Milestone, we saw a significant increase in slender wheatgrass and no injury to this grass in the plots where it previously co-existed with the thistle," Samuel explains.

"Two years after treatment wherever we had removed the Canada thistle a large increase in overall native plant cover was observed including species such as slender wheatgrass, western snowberry (*Symphoricarpos occidentalis*) seedlings and other native plants that moved back in. This is significant because we did not want to replace one non-native undesirable (Canada thistle) with another undesirable species (such as cheat grass (*Bromus tectorum*). This did not occur due to the abundance of native species. The Canada thistle was preventing the native species from revegetating these open spaces and once it was removed, the native plants moved back in," he concludes.

"In my opinion, a land manager faced with an invasive weed problem such as Canada thistle is much better off controlling the weed and achieving great control than worrying about possible injury to native species. Removal or control of a weed such as Canada thistle with Milestone herbicide is a great way to jump start native species recovery in infested areas."

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